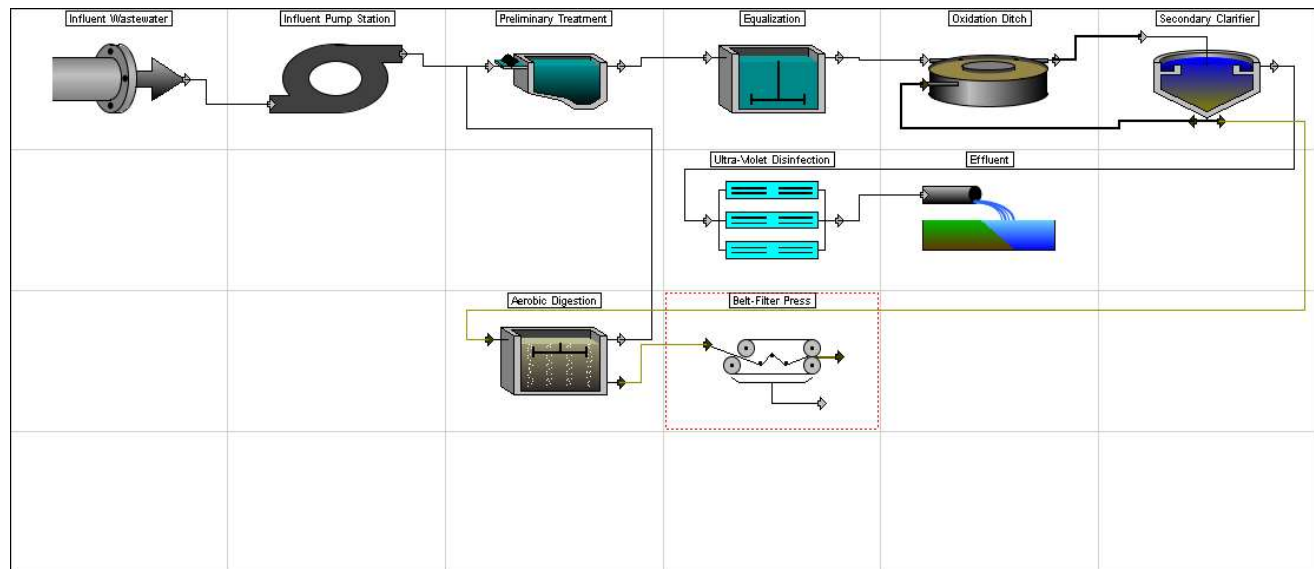


### Layout 1 Salem City



#### Summary

#### Equipment Database

Hydromantis 2014,(USA Avg)

#### Layout Summary

Description	Value	Units
<b>CONSTRUCTION COSTS</b>		
Unit process construction cost:	\$7,940,000	\$
Other direct construction costs	\$2,760,000	\$
Other indirect construction costs	\$8,090,000	\$
<b>Total construction costs</b>	<b>\$18,800,000</b>	<b>\$</b>

#### ANNUAL COSTS

##### LABOR COSTS

Administration labor cost	\$24,700	\$/yr
Laboratory labor cost	\$134,000	\$/yr
Unit process operation labor cost	\$277,000	\$/yr
Unit process maintenance labor cost	\$139,000	\$/yr
<b>Total labor costs</b>	<b>\$574,000</b>	<b>\$/yr</b>

##### MATERIAL COSTS

Total material cost	\$89,400	\$/yr
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##### CHEMICAL COSTS

Total chemical cost	\$21,100	\$/yr
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##### ENERGY COSTS

Total energy cost	\$297,000	\$/yr
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Total operation and maintenance	\$981,000	\$/yr
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##### CONSTRUCTION COST AMC

Amortization cost for total construction	\$1,590,000	\$/yr
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<b>Total annual project cost</b>	<b>\$2,570,000</b>	<b>\$/yr</b>
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#### PROJECT SUMMARY

Present worth	\$30,800,000	\$
Total project cost	\$18,800,000	\$
Total operation labor cost	\$435,000	\$/yr
Total maintenance labor cost	\$139,000	\$/yr
Total material cost	\$89,400	\$/yr
Total chemical cost	\$21,100	\$/yr
Total energy cost	\$297,000	\$/yr
Total amortization cost	\$1,590,000	\$/yr

#### Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	555000	28200	18500	3890	0	12600	49200
Preliminary Treatment	409000	35600	15400	10200	0	1950	34300
Aerobic Digestion	303000	69200	26900	26400	0	58600	26300
Equalization	248000	32000	20200	1840	0	18500	23400

Ultra-Violet Disinfection	3580000	0	36000	35800	12500	89400	303000
Belt-Filter Press	812000	2600	504	0	8610	1700	74300
Oxidation Ditch	1210000	64800	0	7270	0	113000	112000
Effluent	0	0	0	0	0	0	0
Secondary Clarifier	409000	44100	21200	3970	0	969	38200
Blower System	408000	0	0	0	0	0	34200
Other Costs	10900000	159000	0	0	0	0	892000

#### Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	11	acre
Administration labor hours	479	hr/yr
Laboratory labor hours	2610	hr/yr
Costs		
<b>DIRECT COSTS</b>		
Mobilization	243000	\$
Site preparation	405000	\$
Site electrical	650000	\$
Yard piping	444000	\$
Instrumentation and control	309000	\$
Lab and administration building	707000	\$
Total direct construction costs	2760000	\$
<b>INDIRECT COSTS</b>		
Cost of land	220000	\$
Miscellaneous cost	615000	\$
Legal cost	246000	\$
Engineering design fee	1840000	\$
Inspection cost	246000	\$
Contingency	1230000	\$
Technical	246000	\$
Interest during construction	1840000	\$
Profit	1600000	\$
Total indirect construction cost	8090000	\$
Total of other construction costs	10900000	\$
<b>LABOR COSTS</b>		
Administration labor cost	24700	\$/yr
Laboratory labor cost	134000	\$/yr

#### Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	2270	scfm
Safety factor	1.5	
Requested air flow capacity	3410	scfm
Total capacity of blowers	3410	scfm
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	3410	scfm
Estimated cost of an installed blower	127000	\$
Blower building area	1030	sqft
Costs		
Construction and equipment cost	408000	\$
Installed Blower Cost	254000	\$
Building Cost	113000	\$
Misc Costs	40400	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	34200	\$/yr

Notes  
Energy costs are shown at the individual unit processes that require air

#### Influent Wastewater

##### Influent Pump Station

##### Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	1180	cuft
Width of wet well	10.9	ft
Depth of the pumping station	26.4	ft
Length of the pumping station	18	ft
Width of the pumping station	38.1	ft
Minimum depth of water in wet well	5.41	ft

Area of pump building	514 sqft
Peak capacity of pumps	5.55 MGD(US)
Firm pumping capacity	5.55 MGD(US)
Total dynamic head - average	45.1 ft
Quantities	
Operation labor required	548 pers-hrs/yr
Maintenance labor required	464 pers-hrs/yr
Electrical energy required	126000 kWh/yr
Volume of earthwork required	130000 cuft
Volume of slab concrete requir	4620 cuft
Volume of wall concrete requir	4560 cuft
Capacity per pump	3860 gpm(US)
Number of constant speed pur	0
Number of variable speed pur	2
Diameter of discharge header	14 in
Total dynamic head	69.5 ft
Size of selected pump	12 in
Specific speed of pump	4640
Pump rotating speed	1550 rpm
Motor size required	93.6 HP
Size of selected motor	100 HP
Width of pump system	3 ft
Length of pump system	18.2 ft
Length of the dry well	18 ft
Width of the dry well	27.2 ft
Costs	
Construction and equipment cc	555000 \$
Earthwork Cost	38500 \$
Wall Concrete Cost	110000 \$
Slab Concrete Cost	59900 \$
Building Cost	56500 \$
Installed Pump Equipment C	183000 \$
Installed Control Module Cos	23100 \$
Misc Costs	84700 \$
Operational labor cost	28200 \$/yr
Maintenance labor cost	18500 \$/yr
Material and supply cost	3890 \$/yr
Chemical cost	0 \$/yr
Energy cost	12600 \$/yr
Amortization cost	49200 \$/yr

### Preliminary Treatment

#### Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	0.375	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.444	ft
Approach velocity	2.5	ft/s
Average flow through velocity (	2.5	ft/s
Maximum flow through velocity	3	ft/s
Screen channel width	0.939	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	6.97	cuft/s
Average flow	2.35	cuft/s
Minimum flow	0.808	cuft/s
Temperature	10.2	deg C
Maximum flow through velocity	1.5	ft/s
Average flow through velocity (	1	ft/s
Size of smallest particle 100%	0.2	mm
Specific gravity of particle	2.65	
Number of units	2	
Maximum flow/unit	3.48	cuft/s
Width of channel	0.581	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.071	ft/s
Slope of channel bottom	0.00344	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	6.1	cuft/d
Costs		
Construction and equipment cc	409000	\$
Operational labor cost	35600	\$/yr
Maintenance labor cost	15400	\$/yr
Material and supply cost	10200	\$/yr
Chemical cost	0	\$/yr

Energy cost	1950 \$/yr
Amortization cost	34300 \$/yr

### Aerobic Digestion

#### Design Output Data

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	10.1	d
Design SS	12000	mg/L
Calculated VSS	5970	mg/L
Calculated VSS:TSS ratio	0.498	mg VSS/mg SS
Total volume of reactors	611	m <sup>3</sup>
Length of parallel train	7	m
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per battery	2	
Oxygen requirement to meet aeration	609	kg/d
Air flow required to meet average	3370	N m <sup>3</sup> /hr
Design air flow	92	N m <sup>3</sup> /min/1000 m <sup>3</sup>
Volatile solids loading	0.0816	lb/(cuft·d)
Solids accumulated	1590	lb/d
Digester capacity	16100	lb
Volume of wasted sludge	73700	gal(US)
Quantities		
Operation labor required	1340	pers-hrs/yr
Maintenance labor required	673	pers-hrs/yr
Electrical energy required	586000	kWh/yr
Volume of earthwork required	24400	cuft
Volume of slab concrete required	5040	cuft
Volume of wall concrete required	4530	cuft
Handrail length	126	ft
Number of diffusers per train	95	
Number of swing arm headers	1	
Costs		
Construction and equipment cost	303000	\$
Earthwork Cost	7220	\$
Wall Concrete Cost	109000	\$
Slab Concrete Cost	65400	\$
Handrail Cost	9450	\$
Installed Aerator Equipment	47400	\$
Air Piping Cost	34200	\$
Misc Costs	30000	\$
Operational labor cost	69200	\$/yr
Maintenance labor cost	26900	\$/yr
Material and supply cost	26400	\$/yr
Chemical cost	0	\$/yr
Energy cost	58600	\$/yr
Amortization cost	26300	\$/yr

### Equalization

#### Design Output Data

Description	Value	Units
Equalization		
Design Information		
Effective storage volume	305000	gal(US)
Average hourly flow	63500	gph(US)
Length of basin	76.5	ft
Width of basin	76.5	ft
Tank volume	525000	gal(US)
Operating transfer efficiency	4.2	lbO <sub>2</sub> /(HP·h)
Power required	31.5	HP
Quantities		
Volume of earthwork required	99100	cuft
Volume of slab concrete required	4380	cuft
Volume of wall concrete required	3210	cuft
Number of aerators per basin	4	
Power of selected aerator	10	HP
Total installed power	40	HP
Operational labor required	621	pers-hrs/yr
Maintenance labor required	506	pers-hrs/yr
Electrical energy required	185000	kWh/yr
Costs		
Construction and equipment cost	248000	\$
Earthwork Cost	29400	\$
Wall Concrete Cost	77300	\$
Slab Concrete Cost	56800	\$
Installed Aerator Equipment	73100	\$
Misc Costs	11800	\$
Operational labor cost	32000	\$/yr
Maintenance labor cost	20200	\$/yr

Material and supply cost	1840 \$/yr
Chemical cost	0 \$/yr
Energy cost	18500 \$/yr
Amortization cost	23400 \$/yr

### Ultra-Violet Disinfection

#### Design Output Data

Description	Value	Units
Ultra-Violet Disinfection Design Information		
Design based on a model calc	0.1	gal(US)/(min·W)
System is not headloss constr		
Total number of lamps needed	792	
Number of spare channels	1	
Total number of lamps used in	1200	
Number of excess lamps	408	
Number of lamps/modules	8	
Number of modules/bank	10	
Number of banks/channel	5	
Number of channels	3	
Calculated headloss	0.127	in
Costs		
Construction and equipment cc	3580000	\$
Cost of installation	2150000	\$
Total cost of UV lamps	1430000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	36000	\$/yr
Material and supply cost	35800	\$/yr
Chemical cost	12500	\$/yr
Energy cost	89400	\$/yr
Amortization cost	303000	\$/yr

### Belt-Filter Press

#### Design Output Data

Description	Value	Units
Belt-Filter Press Design Information		
Belt filter width	1	m
Number of units	1	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	21.2	gpm(US)
Final solids content	16	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	50.5	pers-hrs/yr
Maintenance labor required	12.6	pers-hrs/yr
Power	17000	kWh/yr
Polymer required	6620	lb/yr
Dry solids produced	1820	lb/d
Belt filter(s)	275000	\$
Building	279000	\$
Installation	68800	\$
Polymer system	82500	\$
Feed pumps	30300	\$
Conveyor system	77000	\$
Costs		
Construction and equipment cc	812000	\$
Building Cost	279000	\$
Polymer System Cost	82500	\$
Feed Pumps Cost	30300	\$
Conveyor System Cost	77000	\$
Installed Belt Filter	344000	\$
Operational labor cost	2600	\$/yr
Maintenance labor cost	504	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	8610	\$/yr
Energy cost	1700	\$/yr
Amortization cost	74300	\$/yr

### Oxidation Ditch

#### Design Output Data

Description	Value	Units
Oxidation Ditch Design Information		
Carbon & Nitrification Design		
Design SRT for design at wint	25	d
Design SS	3000	mg/L
Calculated VSS	1870	mg/L
Calculated VSS:TSS ratio	0.623	mg VSS/mg SS
Total volume of reactors	10500	m <sup>3</sup>
Ditch length	68.2	m
Ditch width	22.8	m

Sidewater depth	3.66 m
Number of batteries	1
Number of parallel ditches per	2
Number of rotors per ditch	2
Rotor length for aeration	20 m
Rotor length for mixing	40.2 m
Installed rotor length per rotor	10 m
Rotor horsepower	20 HP
Total installed horsepower per	80 HP
Assumed surface velocity	0.46 m/s
Hydraulic retention time	43.5 hr
F/M ratio	0.0596 lb BOD/lb MLSS/d
Volumetric BOD loading	0.111 kg BOD/m <sup>3</sup> /d
Observed yield (VSS basis)	0.485 g VSS/g BOD
Observed yield (TSS basis)	0.779 g TSS/g BOD
Amount of alkalinity required	161 gCaCO <sub>3</sub> /m <sup>3</sup>
Amount of sludge generated	1260 kg/d
Sludge recycle rate	2470 m <sup>3</sup> /d
Nitrogen requirement for biom:	13.6 mg/L
Phosphorus requirement for bi	2.71 mg/L
Oxygen requirement to meet a	2680 kg/d
Quantities	
Ditch bottom width	36.9 ft
Length of straight section	150 ft
Volume of excavation required	200000 cuft
Volume of backfill required per	6290 cuft
Volume of wall concrete requir	18900 cuft
Volume of slab concrete requir	25100 cuft
Length of adjustable weir	24 ft
Volume of concrete required p	116 cuft
Total handrail length	0 ft
Operation labor required	1260 pers-hrs/yr
Electrical energy required	1130000 kWh/yr
Costs	
Construction and equipment co	1210000 \$
Earthwork Cost	59200 \$
Wall Concrete Cost	460000 \$
Slab Concrete Cost	326000 \$
Handrail Cost	0 \$
Installed Equipment Cost	307000 \$
Misc Costs	59900 \$
Operational labor cost	64800 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	7270 \$/yr
Chemical cost	0 \$/yr
Energy cost	113000 \$/yr
Amortization cost	112000 \$/yr

### Effluent

#### Design Output Data

Description	Value	Units
Costs		
Construction and equipment co	0	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	0	\$/yr

### Secondary Clarifier

#### Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	3810	sqft
Surface area per circular clarifi	1910	sqft
Diameter of each circular clarif	50	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	14.3	lb/(sqft-d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft-d)
Weir length	191	ft
Volume of wasted sludge	32300	gpd(US)
Quantities		
Operation labor required	573	pers-hrs/yr
Maintenance labor required	313	pers-hrs/yr
Electrical energy required	8600	kWh/yr
Volume of earthwork required	47800	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	4070	cuft

Wall thickness	11.5 in
Volume of wall concrete required	3380 cuft
Costs	
Construction and equipment cost	369000 \$
Earthwork Cost	14200 \$
Wall Concrete Cost	81300 \$
Slab Concrete Cost	52800 \$
Installed Equipment Cost	165000 \$
Misc Costs	56300 \$
Operational labor cost	29500 \$/yr
Maintenance labor cost	12500 \$/yr
Material and supply cost	3690 \$/yr
Chemical cost	0 \$/yr
Energy cost	860 \$/yr
Amortization cost	34500 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0323 MGD(US)
Total pumping capacity	0.0323 MGD(US)
Design capacity per pump	11.2 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0323 MGD(US)
Quantities	
Operation labor required	283 pers-hrs/yr
Maintenance labor required	217 pers-hrs/yr
Electrical energy required	1090 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment cost	39300 \$
Earthwork Cost	476 \$
Pump Building Cost	22100 \$
Installed Pump Cost	10800 \$
Misc Costs	6000 \$
Operational labor cost	14600 \$/yr
Maintenance labor cost	8660 \$/yr
Material and supply cost	275 \$/yr
Chemical cost	0 \$/yr
Energy cost	109 \$/yr
Amortization cost	3720 \$/yr